

REMARKS

Applicant thanks the Examiner for indication that the drawings filed on November 20, 2003 are accepted by the Office. The acknowledgment of a claim for foreign priority under 35 U.S.C. §119 and indication that the certified copies of the priority documents have been received by the Office is also noted with appreciation.

The specification has been amended in order to correct a few grammatical errors. No new matter is introduced by this amendment.

Claims 1 to 5 and 10 to 24 are currently active in the application. Claims 6-9 have been canceled in the paper filed May 17, 2005. Claims 1, 10 and 11 have been slightly amended in order to properly reflect the structure of the claimed inkjet head and claim 24 has been added for the Examiner's consideration. The support for the present amendment can be found at least in Figure 4 and page 13, lines 17 to 25. No new matter is introduced by this amendment.

Claims 1, 5 and 10 have been rejected under 35 U.S.C. §102(b) as being anticipated by the U.S. Patent 5,818,482 to Ohta et al. This rejection is respectfully traversed for the reason that the patent to Ohta et al. fails to show the claimed invention.

The present invention resolves the problem occurring in conventional inkjet heads due to relative flexibility of a chamber plate, especially high density nozzle inkjet heads. Specifically, deformation of piezoelectric elements has a tendency to deform the entire chamber plate, not just the corresponding pressure chamber. This displacement, generated by the piezoelectric element, generates crosstalk between neighboring nozzles which in its turn reduces consistency in speed of ejected ink droplets or otherwise degrades ejection characteristics since an ink meniscus in neighboring nozzles can vibrate. Crosstalk between the nozzles can become particularly serious when a great number of piezoelectric elements are driven simultaneously. An additional disadvantage of a very flexible chamber plate is the fact that, when a center of the chamber plate is deformed by a piezoelectric elements, change of the ejection characteristics at the nozzles near

the center of the head is different from those near the ends of the head. That is why the claimed invention aims to significantly improve rigidity of a chamber plate in order to stabilize consistency of speed of ejected droplets of ink. In order to do that, the present invention uses a housing "...having a first surface and a second surface opposing the first surface, the first surface being adhered to the diaphragm, the first surface being formed with a plurality of first grooves that extend in a second direction perpendicular to the first direction, the first grooves confronting the pressure chambers with the diaphragm interposed between the first grooves and the pressure chambers, the second surface being formed with a second groove that extends in the first direction, the first grooves intersecting the second groove at positions that confront the pressure chambers, wherein a plurality of through holes that extend from the first surface through to the second surface of the housing are formed where the first grooves intersect the second groove..." (Claim 1)

The patent to Ohta et al. also recognizes the problems caused by deformation of oscillation plate. However, Ohta et al. proposes an absolutely different solution. In order to eliminate the interference of the deformations of the adjacent piezoelectric elements and the interference of the ink discharging operations of the adjacent nozzles, two groups of alternatively used piezoelectric elements are proposed in order to avoid simultaneous activation of neighboring nozzles. Specifically, a first group of piezoelectric elements are actuated to apply a compressive force to the ink when second group of piezoelectric elements are not actuated and vice versa. The usage of the alternative groups of piezoelectric elements allows for an increase the efficiency of the ink discharge by minimizing the interference between the ink chambers.

The Examiner equates the claimed invention with the recording head described by Ohta et al. Applicant respectfully disagrees. The claimed invention significantly increases the rigidity of the chamber plate. The claimed invention accomplishes this with the housing 15, which includes two groups of perpendicular grooves 17 and 18 that create through holes 19. The through holes

19 are formed through the housing 15 at positions where the grooves 18 and 17 intersect. Each of the through holes 19 receives one of the piezoelectric elements 4. It should be specifically noted that the restrictor plate 11, providing side walls of the pressure chamber 2, is adhered to the thin sections 21 on housing through the diaphragm 3. The thin section 21 of housing 15 increases the rigidity of the pressure chambers 2 so that crosstalk among the nozzles 50 can be suppressed. Additionally, according to the present invention, the pressure chambers 2 can have higher rigidity because the thin sections 21 serving as the side walls between adjacent through holes 19 are adhered to the diaphragm 3. The claimed structure prevents interference between adjacent nozzles and avoids degradation in printed image quality in association with decrease in ink ejection speed.

According to the present invention as defined in claim 1, the housing has the first surface formed with a plurality of first grooves. The Examiner contends that the frame 5 of Ohta et al. corresponds to the claimed housing, and the opening 5b of Ohta et al. to the claimed plurality of first grooves. However, a plurality of openings 5b is not formed in the frame 5 as can be seen from Fig. 2 of Ohta et al. Therefore, it is inappropriate to equate the claimed housing with the frame 5.

According to the claimed invention, a plurality of through holes is formed in the housing, where the first grooves formed in the first surface of the housing intersect the second groove formed in the second surface of the housing. The Examiner contends that the opening 5b of Ohta et al. corresponds to the claimed first grooves, and the area between the piezoelectric elements 7 and 8 to the claimed second groove. On the contrary, in Ohta et al., the opening 5a is not formed where the opening 5b intersect the area between piezoelectric elements 7 and 8 in the assembled state.

Further, it should be respectfully noted that the openings 5a and 5b of Ohta et al. are the same in shape and role, hence it is inappropriate to consider that the opening 5a corresponds to the through holes, and the opening 5b to the first grooves.

Furthermore, according to the claimed invention, the first surface is formed

with a plurality of first grooves, and the area between the first grooves is adhered to the diaphragm. This increases the rigidity of the pressure chambers so that crosstalk among the nozzles can be suppressed. However, in Ohta et al., the opening 5b (corresponding to the claimed first grooves) is a single through hole, so the frame 5 (corresponding to the claimed housing) does not have an area to be adhered to the oscillation plate or diaphragm 12. Accordingly, with the structure of Ohta et al., it is impossible to increase the rigidity of the pressure chambers.

Additionally, the Examiner in order to create the claimed invention, provides a recollection of different holes and grooves from the different elements of the inkjet head shown by Ohta et al. This is totally wrong, since claim 1 clearly states that first and second grooves belong to the housing 15. Housing 15, shown in Figure 5 of the present disclosure, comprises a one piece structure with first and second grooves perpendicular each other. The fact that both grooves belong to the housing 15 contributes to the rigidity of the claimed structure. However, the Examiner states that the first grooves shown by Ohta et al. in Figure 2 as element 5b and second grooves are presented as "area between elements 7 and 8 in Figures 2 and 3". Additionally, the Examiner calls a single channel 5a in Figure 2 of Ohta et al. as "a plurality of through holes". This is not correct. Specifically, claim 1 recites, "An inkjet recording head comprising:

a pressure chamber plate formed with a plurality of pressure chambers filled with ink, the pressure chambers being aligned in a row that extends in a first direction;

a diaphragm adhered to the pressure chamber plate;

a housing having a first surface and a second surface opposing the first surface, the first surface being adhered to the diaphragm, the first surface being formed with a plurality of first grooves that extend in a second direction perpendicular to the first direction, the first grooves confronting the pressure chambers with the diaphragm interposed between the first grooves and the pressure chambers, the second surface being formed with a second groove that extends in the first direction, the first grooves intersecting the second groove at

positions that confront the pressure chambers, wherein a plurality of through holes that extend from the first surface through to the second surface of the housing are formed where the first grooves intersect the second groove;..." (Emphasis added)

It is clear that the prior art relied on by the Examiner does not show a housing with first groove intersecting second grooves forming through holes.

MPEP 2131 mandates that "TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT IN THE CLAIM".

Furthermore, the MPEP, citing Richardson V. Suzuki Motor Co., 9 USPQ2d 1051, 1053 (Fed. CIR. 1987), states "[t]he identical invention must be shown in as complete detail as is contained in the ..claim" (emphasis added)

Here, none of structural limitations highlighted in Applicant's claims above are taught or suggested by Ohta et al. It is therefore respectfully submitted that the rejections to the claims are improper under 35 U.S.C. §102 as Ohta et al. cannot anticipate the rejected claims since it does not "teach the identical invention". Further, since the above limitations are not taught or suggested, Ohta et al. cannot be used to support a *prima facie* obviousness rejection under 35 U.S.C. §103. Bases on the above discussion with reference to the MPEP guidelines, it is respectfully requested that the rejections based on 35 U.S.C. 102 be withdrawn.

Claims 3 and 4 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Ohta et al. (U.S. Patent 5,818,482) in view of Ito et al.. This rejection also respectfully traversed.

The patent to Ohta et al. has been distinguished above. The Examiner relied on patent to Ito et al. as showing the groove forming machine which is a dicer or a wire saw. However, since how it was discussed above the primary reference to Ohta et al. cannot be used to support a *prima facie* obviousness rejection, the patent to Ito et al. cannot make up for the deficiencies of Ohta et al. Therefore, the withdrawal of rejection of claims 3 and 4 is respectfully requested.

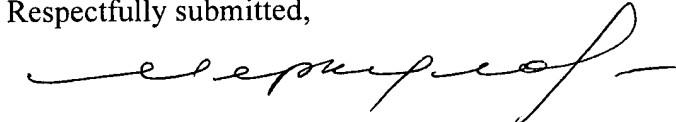
In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 1, 3-5 and 10 be allowed, and that the application be

passed to issue. Further, since claim 1 is generic to the several disclosed species and has been shown to be allowable, claims 2 and 11-24 should also be allowed.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson, P.C.).

Respectfully submitted,



Olga V. Merkulova
Reg. No. 48,757

Whitham, Curtis & Christofferson, P.C.
11491 Sunset Hills Road, Suite 340
Reston, VA 20190

Tel. (703) 787-9400
Fax. (703) 787-7557

Customer No.: 30 743